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IB MYP Year 5

Year 10 Mathematics

Assessment #3

TRIGONOMETRIC PATTERNS

Unit Question: How do we get around? aTeachers: Ms. Luk & Mr. Slosberg
End Date: March 15, 2013 Time Allowed: Double Lesson
Concept Statement: The student will discover one or two formulas which will be useful in the future.

The objective of this task is discover a useful formula for finding out new trig. values from old ones.

IN YOUR BOOK:

- New Trends Mathematics, Chapter 3 & 9 on Trigonometry

INSTRUCTIONS:

- Read the **instructions** and **rubric** carefully.
- Show all **steps** and proper **units.**
- Submit **your own work.** Any copying or other cheating, will automatically receive a 0.
- You are allowed to use non-electronic **dictionary**.
- **Calculators** are allowed.

ASSESSMENT:

- Read the criteria descriptors on the next page carefully before you start your work. This will give you a clear understanding of what is required and what a quality piece of work for this task must include. This way you give yourself the best chance of achieving the highest level in this task.
- This task assesses Criteria B.

Criterion B: Investigating Patterns

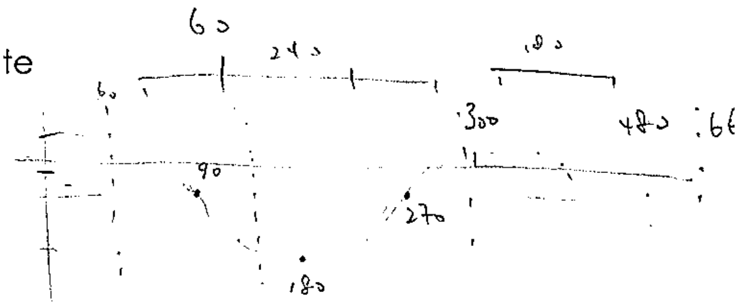
Achievement level	Task Specific Rubric	IBO Published Descriptor	Student's Self-Evaluation
0	The student does not reach a standard described by any of the descriptors given below.	The student does not reach a standard described by any of the descriptors given below.	
1–2 Do Maths	The student can calculate trigonometric values correctly.	The student **applies, with some guidance,** mathematical problem-solving techniques to recognize **simple** patterns.	**(0-8)**
3–4 General Rule	The student comes up with a general rule relating the trigonometric ratios.	The student **applies** mathematical problem-solving techniques to recognize patterns, **and suggests** relationships or general rules.	**Teacher's Final Grade**
5–6 Test it	The student tests their general rule by taking a few more examples.	The student **selects and applies** mathematical problem-solving techniques to recognize patterns, **describes** them as relationships or general rules, and **draws conclusions** consistent with findings.	
7–8 Prove it	The student explains how certain they are that they are right and why.	The student **selects and applies** mathematical problem-solving techniques to recognize patterns, **describes** them as relationships or general rules, draws the **correct conclusions** consistent with the correct findings, and **provides justifications or proofs.**	**(0-8)**

ASSESSMENT

Level 1-2

1. Given the following expressions, evaluate
   - a. sin(x)
   - b. sin(2x)
   - c. $\sin^2(x)$
   - d. cos(x)
   - e. cos(2x)
   - f. $\cos^2(x)$

   for x = 30°, 150°, 240°, 330°.



Level 3-4

2. Organize the data you found from question 1.
3. Describe a general rule you found involving either sin(2x) or cos(2x)

Level 5-6

4. Suggest another example or two to make certain it is right.

Level 7-8

5. Test your pattern with other methods/identities, justify your formula(s) and give limitations if there's any.

~ End of Assessment ~

$\cos 60 = \frac{1}{2}$

60 . . . 120 180

$\cos(2x)$ =

$\cos 60 \times 2 = 1$ -

$\frac{1}{2}, -\frac{1}{2}, -1, -\frac{1}{2}, \frac{1}{2}, 1, \frac{1}{2}, -\frac{1}{2}, -1, -\frac{1}{2}, \frac{1}{2}$

$660 = \frac{1}{2}$, $840 = \frac{-1}{2}$, $1020 = \frac{1}{2}$

$1200 = \frac{-1}{2}$

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1,2)

	$\sin(x)$	$\sin(2x)$	$\sin^2(x)$	$\cos(x)$	$\cos(2x)$	$\cos^2(x)$
$x=30°$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	0	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	-1
$x=150°$	$\frac{1}{2}$	$-\frac{\sqrt{3}}{2}$	0	$-\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	-1
$x=240°$	$-\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{2}$	0	$-\frac{1}{2}$	$-\frac{1}{2}$	1
$x=330°$	$-\frac{1}{2}$	$-\frac{\sqrt{3}}{2}$	0	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	-1

3) In $\cos(2x)$, if $x = 30°, 150°, 240°, 330°$
answers only surround $\frac{1}{2}$, $-\frac{1}{2}$, which means the answers only alternate between positive and negative, but the answers ~~the~~ stay in the same sequence.

~~The sequences shows that starting from 60, when 180° is added or subtracted from the original degree, the answers only alternate between $\frac{1}{2}$ or $-\frac{1}{2}$.~~

Since ~~为~~ the equation is $\cos(2x)$, the difference between the numbers are 180, where originally is 90.
In $\cos(2x)$, $2x = x + 180$
where $x + 180 = \frac{1}{2}$ or $-\frac{1}{2}$
In conclusion, when the degree is added or subtracted by the same number, the answer will alternate between positive and negative, but numbers are the same sequence

4) $\cos(2x)$, where $x = 60, 120, 180, 240, 300, 360$
$\cos[2(60)] = \frac{1}{2}$, $\cos[2(120)] = -\frac{1}{2}$, $\cos[2(180)] = 1$, $\cos[2(240)] = -\frac{1}{2}$
$\cos[2(300)] = -\frac{1}{2}$, $\cos[2(360)] = 1$

where $x = 40, 80, 120, 160, 200, 240, 280, 320$
$\cos[2(40)] = 0.173$, $\cos[2(80)] = -0.93969$, $\cos[2(120)] = -\frac{1}{2}$
$\cos[2(160)] = 0.766$, $\cos[2(200)] = 0.766$, $\cos[2(240)] = -\frac{1}{2}$,
$\cos[2(280)] = -0.93969$, $\cos[2(320)] = 0.173$

where $x = 85, 170, 255, 340, 425, 510, 595$

$\cos[2(85)] = -0.984$, $\cos[2(170)] = 0.93969$, $\cos[2(255)] = -\frac{\sqrt{3}}{2}$,
$\cos[2(340)] = 0.766$, $\cos[2(425)] = -0.6427$, $\cos[2(510)] = \frac{1}{2}$
$\cos[2(595)] = -0.342$

5) The test shows that the rule applies except for when $x = 85$
It shows that number that end with a zero, for example; 30, 40, 50, 60 ... can apply with the rule, but for other number it doesn4.
The special angles ~~[illegible]~~ doesn4 affect the rule since as prove with the test when $x = 40$, where it is not a special angle.